

Gamification of the crowdsourced delivery service

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Abstract

PiggyBaggy is ride-sharing service. The system applies crowdsourcing model, where participants accomplishing parcel transportation are rewarded with the small amount of money. Through this system, users are able to request different type of delivery and transport it to the necessary destination. Despite the prevalence of crowdsourcing, the number of engaged users is not increasing. The possible drawbacks of PiggyBaggy can be that it is not adapted into delivery environment where delivers can be from walkers to drivers. Moreover, it demands to do additional research to find out other motivators for delivery except the money. One of the suggestion to increase the number of new users and keep current users for a long period is gamified service.

The aim of the thesis is reveal the effect of gamification in crowdsourcing model to increase intrinsic motivation to participate in the service voluntarily. The study includes conduction of test sessions, where participants use gamified and non-gamified prototypes and estimate their feeling in survey. Th experiment applies game mechanics on the base of Octalysis framework.

Gamification of the delivery service:

- Concept of being hero in the city implemented in the design of user interface
- Each delivery is a mission
- Completed mission is awarded by points, power, and health
- Rating system between other participants based on awards

Keywords and terms: crowdsourcing, gamification, game mechanics, intrinsic motivation, extrinsic motivation, Octalysis framework.

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1. Introduction

During the last decades, the working process between a company and employee has transformed into a new model of cooperation. The shift relates to the development of digital environment that formed a new way of cooperation between the participants of this field. The visible change especially reflects in the process of hiring. The usual department of human resources perceives numerous amount of responses to the open position that complicates recruiting and extends time for searching suitable professional. Therefore, the process reforms in alternative option. The traditional way of searching a person for the tedious work is replaced by task division and distribution of tasks to a several executors instead of one [Harris, 2011]. Such model of an institution offering tasks for sourced individuals is known as crowdsourcing [Brabham, 2013].

The prevalence of crowdsourcing connects with the diversity of daily activities and their digitalization. The availability of work, small money compensation, time flexibility and opportunity to choose the task establish favourable environment for interested people. Despite of listed advantages, crowdsourcing is still have problems in people engagement [Rosen, 2012]. The reason is considered in individual case.

The core resource of crowdsourcing is community. Therefore, the main goal is to awake people's interest to cooperate in this business model. There are various way to cause users concernment. The variations causing social interest in this mechanism depends on the activity. The diversity of crowdsourcing type differs according to the task nature and suggested time for accomplishment. The member of crowdsourcing may get financial reward. Such approach is usually used by startups to attract people as the marketing in first period of product launch [Schlagwein and Bjørn-Andersen, 2014]. The other examples of similar approach in crowdsourcing service is Amazon Mechanical Turk (AMT). AMT is alternative way to get money, so many members use it as extra source of income. The motivational argument in this project is financial reward. Unfortunately, not all startups can afford sufficient monetary compensation. There is need find another way to engage people in crowdsourcing.

The development of web technologies allows crowdsourcing exists in online and offline environments. The pervasiveness of mobile devices and their flexibility expands the potentiality of crowdsourcing. The profitable model comprises the distribution of tasks through software, and its realization in offline context. One of such mergers is logistic service with tasks published online. The research of low engagement of people is reviewed on the example of PiggyBaggy service in

Helsinki, Finland [Ginn, 2015]. It is crowdsourcing web-service with the transportation of small sized packages. Couriers do not work as permanent employees as they are recruited from the citizens. They transportation is voluntarily with small money reward. The deliveries can use various type of vehicles to reach the destinations. Mostly, members of PiggyBaggy are cyclists. It connects with the comfort movement in the city and support of ecological cleanness. Though the concept is appealing, the existing drawback is low engagement of volunteers. People realizing delivery need more strong motivation than small monetary compensation to be interested for the long term period.

In general, parcel transportation by bicycle is physical activity with high endurance. The need to participate in such activity requires strong personal motivation. There is a condition where person do not pay attention on efforts, if the process is enjoyable. For example, playing games. During this process, person receives positive emotions and the chance of repeating challenge is enhancing. Therefore, the suggested solution is integration of game elements into existing service, or in other words gamify the system.

There is example of successful gamified service as Duolingo application for language study [Garcia, 2013], where students gets points, rewards and increases levels for learned information. Another example is 4Food network for providing healthy food and other services, their customers are able to make own burgers and share the results with others [Foo and Martensson, 2016]. At the same time, there are services with less profitable integration. Functioning gamification implementation depends on various factors, the goal of the thesis to define core components and test their efficiency in a parcel transportation.

The thesis is directed to determine the reasons of engagement in the physical activity as the delivery by bicycle and enhance these reasons with applying right features of gamification. There are following research questions of the thesis:

- What affects voluntarily engagement in the activity?
- What elements of gamification are appropriate for the delivery service?
- How gamified delivery service will enhance participation in crowdsourcing service?

The thesis consists of seven chapters. The term of crowdsourcing and gamification is explained in Chapter 2. It also determines the behavioral phenomenon as intrinsic motivation affecting user preference to cooperate. The emotional state of this behavior became the foundation of gamification. The design of appropriate gameful framework for the delivery service is described in the chapter 3. This part of the thesis acknowledges with the selected gamified elements based on the

chosen Octalysis framework. The approach is implemented into two prototypes, gamified and non-gamified options, and tested in Chapters 4 and 5. The conclusion of analyzed results is summarized in the Chapter 6.

2. Background and theory

2.1 Crowdsourcing and gamification

Crowdsourcing is a new web-based business practice of attracting large number of people for collaboration and collective solving of problems [Howe, 2006]. Crowdsourcing suggests that there is a network of people who respond to online proposals and thus come up with innovative and quick solutions. One of the main prerequisites is the ability to reach out to as large network of potential employees as possible. The digital environment became such platform for connecting suppliers and employees [Brabham, 2008]. The possibility to differentiate tasks on small parts allows to find solution as multitude of independent elements in shorter time and with less efforts accomplished by number of people in comparison with a long work of one person. Such phenomenon of problem-solving was rapidly spread in the digital environment. Crowdsourcing can be both formal and informal process. It can be used in finding solutions in scientific areas or it can be used to simply ask for help from local people in locating some shops. Therefore, the required skills and capabilities are also depends on the task requirements.

The wide growth of crowdsourcing is linked to the availability of work, money compensation, time flexibility and opportunity to choose the task [Doan et al., 2008]. For this reason, such system attracts considerable amount of participants. The phase of recruiting people is mostly based on the matching of one's skills to the task description.

There are different types of crowdsourcing tasks which depend on the task and necessary time for its accomplishment. One of such crowdsourcing types is the delivery service with voluntary members. In the crowdsourcing delivery service the registered users can see orders to deliver something (usually small-sized goods) on their apps, the price for order and location of the order. Based on the information provided in the app they can either take the order or ignore it if they are not interested and price is not sufficient or attractive for them. The digital platform works as a means of communication and monitoring between the customer and performer of the order.

One of such examples of crowdsourced delivery business model is PiggyBaggy. This service, based in Finland, is a company, which provides distribution of goods from one place to another place via ridesharing [Ginn, 2015]. In Helsinki, Finland, there is a growing trend towards replacement of cars with bicycles. This trend is supported by young responsible people who are willing to save money and protect environment [Kallio et al., 2016].

However, one of the necessary requirements and challenges for the success of crowdsourcing is to ensure participation of sufficient number of people [Brabham, 2013]. Crowdsourcing services might be both paid and unpaid and they largely depend on people's willingness to engage in the activities. Even though the performers of the crowdsourcing deliveries usually receive financial rewards for successful task accomplishment, payment only can be not enough for permanent encouragement of participation. The members of crowdsourcing services consider it as a one-time activity rather than consistent work. The reasons of decline in users' interest to the crowdsourcing services relate to the low usability level, unclear tasks and boring process that creates frustrating user experience [Schenk and Guittard, 2011]. If one analyzes and evaluates the crowdsourcing delivery services from the point of main principles of the usability evaluation, one might conclude that boring nature of task implementation is a challenge for crowdsourcing delivery service. Financial reward is not a sufficient reason to attract more people to participate voluntarily in crowdsourcing activities. Therefore, for crowdsourcing organizations it is vital to develop the system, which will attract users to participate and maintain their interest throughout the whole performance.

The opposite side to the boring process in crowdsourcing is fun. Hence, changing the attitude to the task implementation is possible by adjustment of emotional state. From another side, there is activity where fun is obligatory requirement. It is games. It leads to one of the solutions to increase users' participation is gamification of the applications because games can provide fun and entertaining experience for users, which will attract them to participate. Presenting delivery services as a game challenge might affect motivation of the workers and the way the tasks are accomplished [Kapp, 2012]. The increase of interest towards gamification is attributed to the progress in technology including cheaper prices of electronic devices, easier data tracking, digitalization of market and success of game industry [Deterding, 2012]. Another factor, which has played its role, might be increased interest towards game studies, where different frameworks are developed to understand how gameful activities encourage and interest people and make simple tasks fun [Kafai, 2006]. Overall, gamification might transform delivery service into a fun and engaging experience.

Gamification is a trend, which is gaining more and more popularity by transforming users into players [Conway 2014]. It is difficult to say that gamification is a complete novelty in industry, having its roots in marketing schemes such as reward memberships, points cards and other tools [Nelson, 2012]. Some marketing strategies have already incorporated gameful elements in order to increase customers engagement, learning and consumptions actions [Sigala, 2015]. It was observed

in marketing practices that inclusion of gameful elements increases satisfaction of consumers making consumption more interesting.

There is no ultimate consensus on what gamification is and what exactly it encompasses. Gamification can be placed at the continuum of varied and interrelated terms of different game concepts, which share commonalities and similar elements. For example, Bouca [2012] claims that gamification has emerged from a larger process of cultural reshape encouraged by success of games and technology. McGonial's [2011] arguments support this view by discussing how alternate reality games lead to internal shift in how people tend to think and act in their routine activities. Moreover, to some extent, alternate reality games can be considered as analogue of gamification process.

Bogost [2011] is also skeptical of the conceptualization of the term of 'gamification' provided by Cunningham and Zichermann [2011]. In his article, he highlights the gamification more than just points or badges features. The game by itself is complicated system with rules and balance. Additional elements as score, progressive bar and others are the way to visualize game process for the user convenience. However, they are not core elements. Therefore, the incentives of service perception as a part of game demands deep approach.

Another perspective on gamification is provided by scholars Deterding et al. [2011]. They argue that gamification is to some extent a part of a larger concept of gameful design. Namely, they consider gamification as gameful design put in action. However, not all scholars agree with that identification of gamification on the continuum of game concepts. For example, Lee and Doh [2012] differentiate between the last two concepts of gamification and gameful design viewing them as two different processes. Other scholars such as Diwald, Möller, Roalter, Stockinger, and Kranz [2013] also agree about the difference in concepts of gamification and gameful design. They argue that it is important to incorporate gameful elements in design at early stages and not in the later separate process of gamification.

Despite different opinions about the concept of gamification, most scholars agree that gamification is a process of adding game elements and game-mechanics to non-game systems and applications to make them more interesting and engaging at the same time having no goal to develop a full game as an end product [Deterding et al. 2011; Conway, 2014]. The goal of gamification is to apply certain game-elements to the system instead of developing a fully-fledged game [Deterding et al., 2011]. Gamified applications are usually less complex in structure and design than "real" computer games: reduced duration of playing, reduced complexity of story, simplified rules. This allows to use

gamified applications on online platforms, websites, smartphones or other gadgets with minimal technical characteristics. So, the gamified applications can be accessed by consumers regularly and repeatedly any time or at any location (e.g. lunch breaks at work, or during their waiting time). The main aim of game mechanisms in such products is not user entertainment, they are focused on adding fun element in non-game activities.

Game mechanics might include such elements as developing reward points systems; transforming user into a hero; unlocking avatars and characters; encouraging visiting new places or levelling up and gaining money [Cunningham and Zichermann, 2011]. However, gamification is not simply about adding some level or point reward system to the existing activity, it is about transforming the whole process. Gamification sets a goal to achieve certain task by affecting user's behavior, by transforming the whole process of work and maintain the interest of the user. Gamification is able to change the perception of product use, but it does not solve the quality of the product or technical issues. Gamification is interpreted as a layer to the core service.

The strategy of applying gamification to existing applications is gaining its popularity even though there is still lack of empirical evidence and data about effectiveness and efficiency of its implementation. The literature on the topic of gamification varies on the continuum from a complete rejection of gamification to acceptance of its positive effects on motivation of users.

The supporters of gamification claim that gamification signaled a shift from viewing pecuniary and instrumental goals as the main sources of motivation [Deterding, 2012]. In the very beginning of the era of gamified reality it seemed amazing for many people that many users are willing to do things for free such as answering surveys or participating in contests. Yet, everything is not that simple and players do not actually do it "for free". McGonial [2011] argues that if gamers find no problem to unite online to solve alternate reality problems then the same logic of game mechanisms can be applied in real world: games can attract people to complete real-life tasks. The peculiarity of gamification is that gamification has ability to provide motivation for users: intrinsic motivation (internal factors) and extrinsic motivation (external factors) [Amir and Ralph, 2014]. Scholars Ryan and Deci [2000] provided explanation of different types of motivation and how they affect humans behavior in their work of self-determination theory. The scholars claimed that intrinsic motivation is based on person's internal desire and joy to perform certain activity, feeling of autonomy and relatedness. In other words, any activity an individual does for his own enjoyment, fun and satisfaction is derived from intrinsic motivation (e.g. hobbies, leisure activities). Extrinsic

motivation, in turn, refers to behavior, which is encouraged by expectation of external rewards such as prizes, trophies, financial compensation etc. The success of gamification strategy depends on its influence on player's motivation. Thus, when people get surprised that players participate in gamified activities for a very small financial compensation, they take into account only extrinsic motivation. However, users can have intrinsic incentives to participate almost "for free". They might have intrinsic motivation of simply enjoying the activity itself, feeling happiness of doing the task, or they can be motivated by winning the points and competing with other players. This property of gamified elements to provide both intrinsic and extrinsic motivation makes gamification so attractive for businesses and companies.

Yet, the attitude towards gamification is very diverse, and gamification has also received certain critics among scholars. These critiques provide larger insight of how gamification process is viewed overall by the opponents. For instance, Bogost [2011] criticizes gamification for exploitation of game elements by the market and businesses for simply achieving easy revenue. The market industry only slightly involve its functions. Moreover, the author criticizes the influence that games have on intrinsic motivation. Bogost argues that gamification replaces real-life motivation with artificial one [Bogost, 2011a]. His criticism shows that many opponents of gamification again focus mostly on extrinsic motivation of gameful experiences ignoring the fact that gamification also provides intrinsic motivation as well.

Psychological and sociological studies respond to the criticism by providing their positive reflection on gamification. For example, Antin [2012] claims that virtual rewards are not the main driving force which increases motivation of people to participate. Such social factors as feeling of belonging to gaming community, peer approval, self-esteem are also crucial factors, which are encouraging participation. This focus of opponents on extrinsic motivation can be explained by the fact that context of gameful elements matters: what is suitable in one environment and field may bring no results in another field. In addition to that, it often happens that when companies try to incorporate gamified experience in their products they limit themselves to reward system only. In other words, they incorporate only extrinsic motivation factors (e.g. points, badges or prizes) and ignore introduction of player-centric methods creating internal motivation.

The strategy of focusing mostly on extrinsic motivation in gamification can be unsuccessful. Some studies show that extrinsic motivation in terms of financial rewards, points or levels might have negative effect of intrinsic motivation [Battaglini et al., 2005], creativity [Toubia, 2006] and

behavioural involvement [Deci et al. 1999]. The scholars explain this phenomenon by the fact that when an individual already sees some intrinsic value in activity the suggested extrinsic encouragement might diminish the intrinsic incentive [Battaglini et al., 2005]. For example, if any application starts providing extrinsic rewards for some tasks that people have already completed without expectations of the rewards and suddenly they stop providing these rewards, the outcome would be worse than in the initial stage without the rewards. People are likely to stop implementing tasks when rewards are no longer provided even though in the beginning they were not troubled by it [Deci et al., 1999]. It is important to be careful when providing extrinsic motivation and to try target intrinsic motivation as well because the later is responsible for playfulness and enjoyment of the practice [Miller and Robertson, 2010]. If not, the game effect might be lost and the activity would turn into simple gathering of points.

Intrinsic motivation has a feature of triggering the state of ‘flow’ in participants – a term which describe special state of maximized focus and attention and which leads to a user’s deep involvement and enjoyment in activity enjoyment [Deci and Ryan 1985; Nakamura and Csikszentmihályi, 1990]. Thus, many scholars [e.g. Deterding et al. 2011; Hayeong et al., 2010] stress that intrinsic motivation might bring long term effects while extrinsic motivation might bring short-term effects and to some extent the former might be more preferable than the latter. Other scholars [Sigala 2015; Hamari et al. 2014], emphasize the need to mix both extrinsic and intrinsic motivation factors because they can complement and strengthen each other. Gamification allows companies to vary which gamified elements they want to introduced based on their goal of intrinsic or extrinsic motivation.

Due to the effect of gamification on user’s motivation, there are many success stories of gamified crowdsourcing systems such as ESP game, FoldIT etc. Due to the fact that one of the main goals of gamification process is to direct people’s behavior, enhance their participation with the given tasks, gamification can be used in recruiting system of crowdsourcing services. The pleasurable experience of gamified crowdsourcing services can attract new customers and users, prolong their attention in completing tasks, increase their involvement and concentration on task implementation and give new inspiration and motivation in participation in crowdsourcing activities. Gamification affects users’ behavior and motivation through gameful elements. The literature on games, gameful experience and gamification provide a different range of gameful elements and their characteristics. According to Yee [2006], the numerous gameful elements usually can be divided into three groups: behavioral (e.g. developing a story/hero, discovery/winning theme, players collaboration etc.);

feedback (e.g. reward system, points, prizes, bonuses etc.); and progress (e.g. achievements; levels, challenges etc.) Gamification can trigger different types of motivation through the gameful elements, which were mentioned. For example, intrinsic motivation can be triggered by creating an interesting storyline, introducing an avatar or fictional alter-ego or a hero, who would represent the user. These game elements help individuals to associate themselves with a certain character, which has certain mission to accomplish. This view completely transforms a simple task of delivery into a mission, which has value and story line and which is needed for other people. Such gamification can enhance participant's feeling of the whole experience of work and its outcomes. The participants might reach the state of "flow", which is frequently experienced by computer games players. Flow is a state when the players are completely immersed in their activity, they lose track of time and do not notice what is happening around them. Ideally, role-playing might attract new recruits in crowdsourcing services because it provide engaging activity of how to spend their time, which has certain storyline, goals, characters address exploratory nature of people.

2.3 Theoretical framework

The role of gamification in crowdsourcing delivery services can be justified by two theoretical foundations: Self Determination Theory (SDT) and Motivation crowding effect theory (MCET).

Self Determination Theory is a theoretical framework of human motivation and personality. Motivation has a great role in human behavior. Motivation can activate all resources of an individual so that he can produce results. It activates personal persistence, direction, intention - all the qualities needed for activity and production. Therefore, to understand the mechanics of how to increase one's motivation to do something is of high importance both for ordinary people in their daily struggles with their life goals and for big organizations, entrepreneurial companies and different types of managerial systems. There is a wide range of means and options of how to increase one's motivation: starting from the external pressure and coercion ending with addressing personal motto and core principles and values. Yet, the difference between being motivated to do something and being forced to do something is obvious. Being intrinsically motivated includes such emotional states as being excited, happy, interested and engaged, which typically results in increased determination and persistence to achieve something. Therefore, it is crucial to understand why some people are motivated and agitated, while others are passive and thus understand what to do to cause this high level of motivation in people.

Understanding motivation of people can help companies and recruiting departments to get the idea how to attract more people to complete the tasks. It can help to derive at the principles of how to affect the motivation of people in a right way and how to affect their behavior. Understanding these principles are very important for crowdsourcing projects, which require high engagement of people. The recruitment processes of socium members may be based on these conceptions.

Self-determination theory provides insight in understanding of motivation and its consequences on people's behavior. Self-determination theory studies influence of social surroundings on individuals' behavioral pattern, values, attitude and other important factors. The framework analyzes how social contexts can explain different levels of motivation among people and different levels of desire for personal development. It provides explanation why some people are highly motivated, proactive and engaged, while others remain passive and alienated. Yet, its difference from other social and psychological studies lies in the approach SDT applies.

SDT assumes that to be “inherently active and intrinsically motivated” throughout whole life is natural for all individuals [Deci and Ryan 1985]. Human beings do not need to develop artificial desire towards development – it is in their nature. From early childhood, humans demonstrate inclination towards intrinsic behavior: children have desire to learn and to be curious and active even without expectation of external rewards. SDT studies which factors diminish or increase this natural propensity for being motivated and active. Based on the empirical evidence, SDT claims that all human organisms have three basic psychological needs – needs for competence, autonomy and relatedness. According to [Deci et al., 1991], the need for competence refers to an individual need to feel control over surroundings, environment and need to master things, challenging tasks and outcomes. The need for autonomy refers to the need of an individual to feel that he is master of his actions and decisions, that he is free and self-regulating in his choice of options. The need for relatedness refers to the need to feel connected, integrated and understood by their social surrounding.

Therefore, these principles of human behavior and motivation might be efficient in context of gamification for the increase of people's participation in crowdsourcing services. Gamification can help crowdsourcing companies to address these basic psychological needs of human beings provided by SDT. Game elements can call out to human need for competence, autonomy, and relatedness transforming existing “order-performance” system into engaging process, where people can satisfy their psychological needs. Currently, the crowd servicing companies mostly provide

extrinsic rewards in form of money compensation. The crowd servicing companies do not provide platform for people to feel integrated in a community, or that their master challenging activities or that they perform un-coerced activities.

Meanwhile, SDT claims that when external motivation aligns with the internal motivation, an individual has better understanding and appreciation of what he is doing and why he is doing it and can self-motivate himself in performing the task [Cunningham and Zichermann, 2011]. However, when the goals are created by external actors for an individual, he has a feeling that he has no power over deciding what is relevant for him and acts according to what others expect of him. This ends in negative perception of the activity and demotivation to perform the task. A user has a feeling that external actors judge his goals for him [Nicholson, 2012]. Thus, external rewards separate from intrinsic motivation lead to almost complete demotivation. This can be observed in real life situations: gained points or badges integrated in reward system are of lower relevance to user if his internal motivation is not addressed. A user has a perception that someone is trying to control his actions and behavior. A user needs to have ability to identify goals, task or activity with his own values and principles. This would respond to his own intrinsic motivation and give him a feeling of autonomous behavior.

If SDT is applied to the crowdsourcing services, it becomes clear why users have low motivation to participate in tasks. However, gamification can transform the whole process because game mechanics is supposed to match and respond to people's own meaningful goals, their values or interests. People satisfy their different intrinsic needs by participating in gameful experience - e.g. need for socializing, satisfying their ego, immersing in game environment [Hamari et al. 2014; Yee, 2006; Kim, 2010]. For example, gamification introduces certain background story or theme. A user is given an option to select his avatar or story line – this gives him feeling of complete control. Moreover, a user is given a chance to cooperate or interact with other players/workers in one way or another. They can either compete with each other, compare their points or communicate to perform certain asks. This gives him feeling of relatedness [Chan and Vorderer, 2006]. In addition to that, users are given points and feedbacks, which can estimate how well he is performing a task, satisfying the need for competence.

It is important to combine both extrinsic and intrinsic motivation [Sigala, 2015], game elements need to combine both extrinsic and intrinsic motivation. It is also important to give the feeling of empowerment for the users so they have options to control and choose options. In addition to that,

gamified activity or task need to appeal to internal values of the users – the users need to be confident in self-identifying with the activity. The activity needs to provide means of communication for users to cooperate and socialize.

SDT as a theory evolved from the research of external rewards on internal motivation, where research findings had revealed that monetary rewards do not necessarily increase motivation but might, unexpectedly, decrease it [Deci et al. 1999]. SDT claims that social environment can have influence on intrinsic motivation depending on how it affects needs for competence or self-determination. Thus, negative reaction in forms of punishment, deadlines or directives [Deci and Cascio, 1972] might undermine basic needs of competence and self-determination and decrease intrinsic motivation. Vice verses, when social surroundings reward the basic psychological needs, the intrinsic motivation increases. The theory suggests that optimal challenges, positive feedbacks and reviews about one's performance might increase intrinsic motivation. [e.g., Frederick & Ryan, 1995]. The empirical evidence show that need for autonomy and competence have impact on intrinsic motivation. Another factor, which play role is a need for relatedness. Despite the fact that intrinsic motivation still may be high in isolation, many people need the feeling of belonging for achieving great results. To stay motivated it is important for many people to feel the support of other people, to feel that other people are interested and involved in their results [Ryan and Grolnick, 1986].

It is important to understand that these principles of increasing one's intrinsic motivation are effective only if certain activity has a value for person itself. If the task or activity is uninteresting for a person to begin with, the principles will not change situation drastically.

Intrinsic motivation has great meaning in lives of people. However, it is not the only force, which triggers certain behavior, especially in case of certain responsibilities or social norms and requirements. Extrinsic motivation refers to behavior in order to achieve certain outcomes or acquire something in return in contrast to the idea of doing something just for the whole idea of doing it as in example of intrinsic motivation. An example of extrinsic motivation might be factors influencing one's ego or self-esteem when people are motivated to show their skills and abilities so that other people will appreciate them [Ryan and Grolnick, 1986]. Factors of ego, pride and self-esteem are partially internally motivated, yet they still need appreciation and recognition from outsiders so they include extrinsic features.

Another theory, which might be helpful in understanding motivation is monetary crowding effect theory. MCET supports the idea that human behavior largely depends on extrinsic and intrinsic motivation. MCET advocates that monetary compensation can have unexpected effect on intrinsic motivation diminishing it [Lepper and Greene, 1978]. This argument is quite controversial for economic theory, which takes into consideration mostly extrinsic motivation. The phenomenon that monetary compensation can in fact decrease individual's motivation to complete the task is contradicting the approach of economic about relative price effect and principle of demand theory. However, MCET argues that incentives coming from the person do play a role. The psychological mechanism is the following: when a person suspects external forces to control his action, his intrinsic motivation declines. Frey and Oberholzer-Gee [1997] summarized MCET into two parts: 1) all external interventions, be they positive or negative, have effect on intrinsic motivation; 2) external intervention in form of monetary compensation can diminish or crowd-out intrinsic motivation.

From the psychological perspective there is explanation for this unexpected impact of monetary rewards on intrinsic motivation. One of the explanations is negative influence on self-determination. When people face external intervention, they have tendency to shift the control or decision-making from themselves to the other party. In such cases, their internal motivation is replaced by external control [Rotter, 1966]. Individuals who find themselves forced to do something find it meaningless to maintain their intrinsic motivation. Another explanation of crowd-out phenomenon can be negative influence on self-esteem. If a person is provided financial reward in the beginning and is not given a chance to show his/her intrinsic motivation, he feels that his decision about involvement is not important. An individual starts feeling that other parties do not acknowledge his own incentives to participate and are not interested in his/her intrinsic motivation, which demotivates him/her. Without a chance to display his or her interest in participating, an individual becomes less inspired in completing work and decreases efforts in task completion.

These two psychological explanations crowding-out effect allow us to generalize which circumstances end in crowding-out effect: 1) Expected external incentives diminish intrinsic motivation when an individual start feeling that he is being controlled. This scenario results in impaired self-esteem and self-determination. 2) Vice versus, intrinsic motivation can increase after external intervention when self-esteem and self-determination are enhanced. If a person feels that he

still has control over his decisions and considers external incentives supportive, his motivation will increase.

Deci and Flaste [1995] argue that in certain circumstances the reward should not be financial at all. They discussed the examples of violin classes: children were demotivated to learn new difficult techniques when symbolic prizes were introduced for good practice. It turned out that children preferred to perform easy and well-known compositions to win the prize. Their intrinsic motivation for development, learning and progression decreased.

This process can work other way around. If the target is increasing intrinsic motivation, the crowding-in effect might be possible.

The crowding out effect is especially significant with monetary rewards. However, the engagement that based only on this effect does not keep crowdsourcing members for a long time. Especially, if task challenge is increasing or tasks are monotonous.

MCET can help to understand why crowdsourcing delivery companies and applications struggle to attract people to perform the task even though they provide financial compensation. Potential deliveries cannot demonstrate their intrinsic motivation to complete the task because they will be given money for their work. Those for whom profit is not the primary goal will not volunteer to perform the delivery service even if they match the task perfectly. The task and the money compensation do not address values and interests of such people. In this case, they might feel they are controlled to do something that they have no interest doing. A feeling that he is doing something for someone for money compensation only can decrease his intrinsic motivation because it affects his feeling of self-esteem and self-determination. However, if gamification is introduced, the scenario changes. The financial rewards are no longer the main driving force for participation. A user might get interested in an interesting avatar or hero, or he wants to follow the storyline and help/save clients, or he wants to cooperate or compete with other players. When financial compensation is not the only factor for participation, potential users get free of feeling their self-esteem is impaired or their decisions are made by others.

Gamification is able to trigger intrinsic motivation by offering independence of performance, use of own skills and relatedness [Przybylski et al., 2010]. At the same time, there is no accurate gameful elements that capable to affect intrinsic motivation. The right application of gamification depends

on the context of the product or service [Richards et al., 2014]. The logical relationship between gameful concept and product promotes successful task performance.

3. Design of the system

3.1 The basic design of prototypes

Design of the system is divided into two prototypes. The first prototype is the delivery service with simple user interface. It consists of basic tasks necessary for choosing delivery, finding destinations and finishing transportation of the goods/items. The process is demonstrated in Figure 3.1. The user interface design follows usability principles [Molich and Nielsen, 1990] for clear functionality. The structure of the information is consistent. The activity starts from choosing parcel, then collecting from destination and delivering it to the final point.

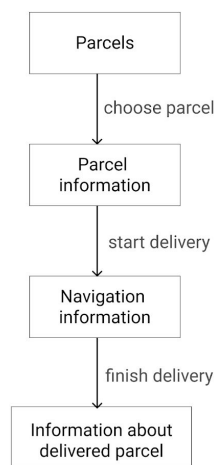


Figure 3.1 flow chart of non-gamified prototype

The second prototype is extended and includes features of game mechanics presented in Figure 3.2. The design of the service is aimed on engagement special group of users -cyclists into crowdsourcing services by doing usual activity and helping other people. Even though the object transportation service includes both delivery person and person placing request, the main interface is developed for the first group of users. The design has three main parts focusing on user engagement, increasing intrinsic motivation and additional impact on extrinsic motivation. Each part has certain distinctive elements explained below.

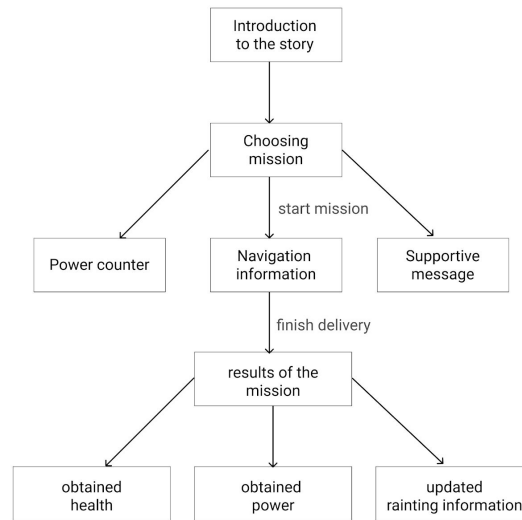


Figure 3.2 flow chart of gamified prototype

3.2 The general description of gamified prototype

Test participant does not register or log in to the system. It is assumed that user is already in the system. For this reason, in the first web pages of interface a deliverer sees the introduction to the application and concept of being a hero. Such storytelling helps the user to feel differently from common state, immerse in gaming environment/story and accept solemnity of following actions.

Next, the user meets a short story and descriptive information about each delivery. It is presented in a form of a mission. From this moment, the delivery is not only a simple activity, it becomes a significant responsibility for the person. Such introduction helps him to imagine the whole service as a part of the heroic city with its missions. Supplementary functions and design elements maintain the engagement during the task completion. During parcel transportation, the user, or the hero of the mission, sees navigated routes and supportive messages. When mission is accomplished, the user gets rewards as power, new position at the rating, health and points, which can be used in next tasks.

3.3 Octalysis framework

Applying gamification to the real-world services as a successful tool to engage users is questionable option. There are various examples of applications where gamification did not work. However, it is necessary to determine what gamification is exactly and cases where it was applied successfully. Most of the products have leaderboards and badges as their core elements. Unfortunately, it is not enough to attract people to use gamified products. An appropriate way can be implantation of game mechanics in a current service. Successful gamified services should have same principles as game

and influence user feelings. For this reason, the chosen design of the service is Octalysis gamification framework. Octalysis is a human-focused gamification framework created by Yu-Kai Chou [2016]. Octalysis framework concerns playing behavior and preferences and suggests diverse methods according to the goal of the service. It contains different methods to trigger user behaviour by core drives, players type and flow of game mechanic. One of the advantages is applying game mechanics from different perspectives. The relation between game features and reason of its implementation. The type of game engagement depends on the affection of each drive in the certain level. Another advantage of this framework is the division of methods on intrinsic and extrinsic motivations. Determined goal of the parcels transportation simplifies the selection of what games mechanics is included in the studied case.

The Octalysis framework triggers user feelings with different methods by applying game core techniques. It consists of five levels. Following first three levels is recommended for the majority of services, while the last two levels is oriented on long term use. According to the Yu-Kai Chou the first three levels is enough for the development of gamified experience for second prototype. The analysis of gamified prototype with Octalysis framework is described in further sections.

3.2 Level 1 of Octalysis

The first level of Octalysis involves eight core drives used in games: social influence, unpredictability, empowerment, meaning, avoidance, ownership, scarcity and accomplishment shown in Figure 3.3. Each level has meaning triggering players to start or continue the game that displayed with various functions. The core drives refer to intrinsic or extrinsic motivators. The drives of extrinsic motivators are ownership, scarcity and accomplishment. Social influence, unpredictability and empowerment refers to intrinsic motivators. Such drives as meaning and avoidance can be used for both extrinsic and intrinsic motivators.

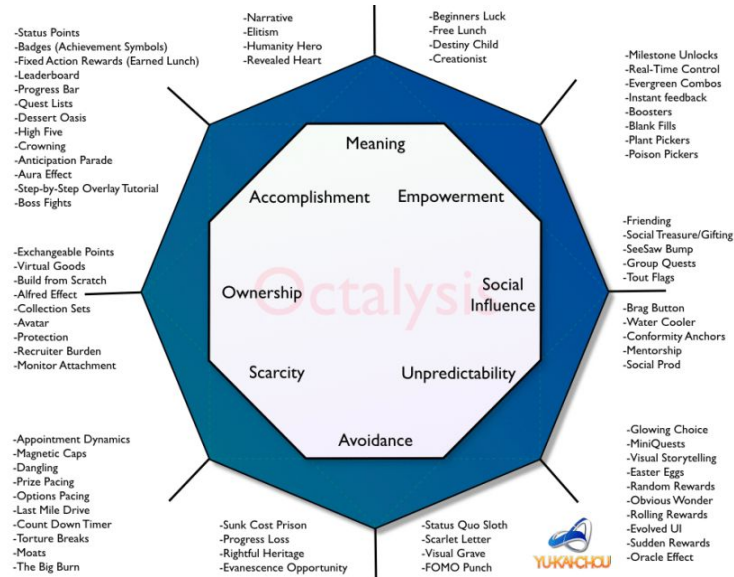


Figure 3.3 Octalysis gamification framework

The gamified prototype does not combine all eight cores as the service needs to trigger only intrinsic motivation and partly extrinsic motivation. Hence, the design involves empowerment, unpredictability, epic meaning and accomplishment. The core drive of empowerment is creativity and feedback in the game giving player opportunity to behave in his own preferred style. The player may create personal strategy to achieve the task and follow it. The designed delivery service does the same. The deliverer is free to choose mission and time for it, and able to start the journey from any point.

Second drive is epic meaning and calling, when player is endowed with special privilege, power and peculiar property of himself. The user's role in the real world can differ drastically from his game character. The feeling of own significance motivates player to return to the gamifies service. Similar approach is implemented in the concept of the gamified prototype through Superhero concept. The general delivery was replaced by a mission, the package transportation implies helping city and saving its inhabitants. From this moment, the whole process has meaning and increased responsibility.

Third drive is unpredictability and curiosity that holds intrigue for the player. The balanced portion of uncertainty engage players to reveal next tasks, levels and capabilities of game character. Gamified application allows participant to exchange points to upgrade avatar and move to the next level of rating.

Fourth drive used in the service is development and accomplishment. This drive maintains balanced challenge in the game and refers to the extrinsic motivation. The visual display of challenge is points, badges, leaderboards and other progress elements. The gamified prototype does not charge points only for mission acceptance, it counts the distance between gathering and transporting points, and counts off 5% of it. The gamified prototype does not have strong way to charge points, the most important is its presence and circulation in the game. Participants are introduced through prototype interface that points can be exchanged with other members for goods. However, they do not have opportunity in current product to interact with them. In other words, they are just familiarized with the exchange concept.

Next step, when service participant achieves certain amount, the new game character position is awarded. Another award is health that is directly connected with physical endurance. In this case, the main benefits for the deliveries are improvement of general physical health due to the increased physical activities as cycling, diversity of the daily routine, benevolence. These motives are implemented in the concept basis of gamified service design. The amount of health is counted in calories burned during cycling. Besides power and health, participant receives rating position. The social aspect of presence of other heroes creates competitive nature in the whole service and brings oblique interaction with other participants. Rating is calculated by summing up the whole amount of power and health for all completed missions, then it is compared with the results of other participants and finally it displays user's position relatively to other "heroes".

3.3 Level 2 of Octalysis

The next level of octalysis gamification is player's journey. Besides the drives, game has other four properties attracting players, they are discovery, onboarding, scaffolding and endgame [Chou, 2016]. It is necessary to change usual service to the gamified one as much as possible to get the profitable result. Saving playing form/character in service grants enjoyment and long-term participation. The discovery property explains the reason to begin their activity. In the delivery service, it is a wish to cycle and the "City Hero" idea. The Onboarding property refers to transportation instruction. It is provided in consecutive tasks presented in the interface through such commands as "Become Hero", "Choose the mission" and etcetary. Some features have additional visual descriptions as icons and emotional avatars. All avatars obtain emotional expressions to display players feelings. The next property, scaffolding, indicates regular tasks for players to maintain the game. In this service, new tasks for deliveries are made by person placing request. Tasks differ from each other due to parcels, distance between destinations and time for deliveries.

Therefore the diversity of the journey happens due to city environment, traffic jam, citizens and weather. The last but not the least property is endgame that retains player after finished transportation. It is a core criterion for the crowdsourced service as it provides long-term participation. The right endgame gives extra reason to come back. Some games include intrigue of what will happen in next levels because of absolutely different surroundings or enemies, or gradually increase challenge saving game flow. In the delivery service, the appropriate endgame state is implemented in variety of real world routes and awards after delivery that can be used to see own progress, compete with other members in rating and have advantages in next deliveries. Such approach shows participant the opportunities to develop an level-up in this crowdsourced service.

3.4 Level 3 of Octalysis

Another implementation peculiar to games is consideration of player type according to Richard Bartle classification [Bartle, 1996]. There are four widespread types of players close to gamer personality and playing behaviour: Achievers, Socializers, Explorers, Killers. These types characterize preferences in the game and how player solves the task. For example, the psychology of Killers players explains their motivation to achieve the tasks and compete with others. Moreover, win is essential only when somebody loses. In contrast to Killers, Achievers do not follow main goal to beat other members in the game. Their preferences build on progressive results and gathering trophies from solved tasks. Such type of players as Socializers tend to participate in the game because of mutual collaboration with other players. The experience of communication, sharing and exchange induces them to get involved in game. The last type, Explorers, shows players as extenders of game borders. They discover new opportunities in the game and possible benefits. Although most of the players are able to combine traits from several types, one of the types is usually stronger in comparison with others.

According to Octalysis, players preferences balance with players journey. Considering playing behavior all players type can find appealing features. Killers have rating scale of all “heroes”, where they can upgrade their status due to the gained points. It matches with social influence drive in the beginning and at the end of the delivery. The rating combines all results from points, health and power. It lists delivery volunteers on the base of total result, not only one of them. If player wants to increase the status, it is obligatory to improve weak part by completing another mission. In addition to it, all missions are different because of the distances and landscape diversity.

Socializers can also interfere with other participants with rating scale in the Endgame journey and request owners. In this case they are interested in number of participants, the activity of all volunteers and period of position changes according to the updated scores.

Explorers crosses player journey on the phase of Discovery with Unpredictability and Curiosity dive and Scaffolding with Empowerment and Creativity feedback. There are two scenarios of their interests in the game. One of them is missions that differ from each other due to parcel type, distance between destinations and city environment. Another scenario is exchange of points. Although test participants are only introduced with the basic concept of probable barter, it is possible to interest them by the trade progress.

Achievers behavior reveals on the scaffolding phase with the Development and Accomplishment dive. Rising the score of points, power, health and number of missions are their main achievements. They are interested in getting favorable combinations. Meanwhile, the missions of gamified prototype does not display beforehand information about the total score after accomplishment. The intrigue of result keeps till the end. In addition to it, during the movement from one destination to another user is able to see the quantity of increasing power. This power retains attention to continue parcel transportation before full accomplishment.

3.5 Storytelling of Superhero concept

The storytelling tells player the reasons to start the game and complete tasks in consistent structure. It is created in such way that induces gamers to finish it. The plot of the game is able to engage players, keep interest and allow to continue it. Storytelling helps to realize the concept and become closer to the subject [Mukherjee, 2015].

As each storytelling has multitude elements in the game, they are logically connected with each other. Therefore, gamified features in the prototype of delivery service are combining with each other according to the plot. Moreover, the development of the story allows to add smoothly new game mechanics in the future.

Before starting to play any new game, players introduce themselves with its brief description. The initial game assessment occurs on this step, and it is important to captivate attention and outstand from hundreds of other games.

Selecting topic for game depends on various factors such as genre, player type, trends and others. Creating special environment and objects for game immerses player into virtual world. The game

atmosphere, background sounds and noises, additional characters affects playing experience by causing emotion. The same approach is not exception for gamified delivery service. User will have certain mood and expectations before initial trying.

The chosen subject is superhero thematic. There are different reasons to apply it. Transporting goods means active movement from one place to another, the difficulty level of performance depends on distance, time, package ergonomics and its fragility. Concerning the dynamic process and inside elements, the chosen topic as superhero saves the nature of action and responsibility. Moreover, the media industry portrays hero as traveller helping people in several places. If character has just obtained super power, he has a mission or duty in another placement. For this reason, transporting good in real environment represents as adventurous hero mission. The chosen storytelling is flexible and does not have strong restrictions that grants user feel voluntariness and freedom of actions.

Another reason explaining the worldwide popularity of hero trend is recent movies and human desire to extend existing abilities beyond the natural physical laws. However, it is considered that only limited number of people is able to obtain unnatural power. Such unspoken norm collegiates with the originated control over other people.

The concept of superhero is implemented in prototype through graphical design and game features. For example, in the beginning user sees the dark background of city and avatar of superhero-cyclist. The dark colors mean dangerous and need for help of citizens. There are also missions on the map marked as red signals to act. The colors of graphical elements are changed during the steps of parcel transportation from dark to light colors. Colors in the design of prototype are significant according to Heidig [Heidig et al., 2015]. If in the beginning user sees prevailing murky color palettes, then in the end of delivery the design of prototype is mostly bright and cheerful to cause positive emotions. The contrast also links with physical endurance of activity.

3.6 Cheerful message

The route between destinations of picking up and delivering goods can vary because of weather conditions, landscape, distance length and general difficulty level. Depending on these circumstances cycling as a sport activity may demand special amount of physical endurance. Even though the studying user group does not consider cycling as special cardio training, it is necessary

to avoid losing enthusiasm after applying the certain amount of endeavour. Therefore, users need additional motivation to complete such action.

The similar situation was researched on marathons by Kristina Knawing [Knawing et al., 2015]. She interviewed sportsmen as marathon runners for determining the driving statement for the long exertion. Beside personal motivation to accomplish race, another significant observation was emotional support from close people, other runners or spectators of running events. The obtainment of positive emotions from audience makes runners to feel the belonging to the whole community.

Even though the system cannot provide emotional feedback from familiar people of participant, it still can cheer users with messages generally. The encouraging message will appear on the difficult part of the road measured beforehand in the prototype. They are displayed during driving from one destination to another on the navigation pages of the process. Such cheerful messages as “you are good at it!”, “don’t give up!”, “your role is important!” shows the significance of participation in the activity. The multiplicity of sentences eliminates the boring monotony of support.

4. Implementation of the system

Both prototypes are implemented as a web application. User interaction happens on web pages. The web application is built with HTML, CSS and JavaScript. Non-gamified prototype uses Bootstrap library as a main style. However, gamified prototype uses own style conforming game concept.

The graphical design of gamified prototype has bright and colorful images with sad or smiling people. The cartoon style of images reproduces game and helps participant to perceive all activity as a game. The badges, points and leaderboard are stylized in heroic topic. The 2d graphic elements of design were made in Adobe Photoshop and Illustrator.

5. Test and evaluation

5.1 Test description

The methodology is based on determination elements of game mechanic driving people to participate voluntarily in the delivery service. It is based on comparison of two prototypes with non-gamified and gamified delivery service. There are two rides by bike, where participant has to choose parcel and deliver it by bike to the indicated address using certain prototype. Participants describe their feelings in the self-reported survey after handling delivery with each prototype. The survey consists of two types of questionnaires created in Google forms. The first type refers to the general delivery service, and the second one to the gamified service. The design of gamified prototype includes triggers of intrinsic and extrinsic motivation. After each session. The questions of survey is formed to collect information about emotional state during transportation.

Each questionnaire has three parts. The first part of Questionnaire 1, that asks about non-gamified delivery service, collects background information about research participants. The second part is about user feeling concerning exactly fun and enjoyment. The third part is about user's wish to participate again.

The Questionnaire 2 asks participants to describe their feelings in the first part, the user encouragement in second part and how game features are enhancing their feelings in the third part. The third part contains images of gamified features as reminders of functionality.

Selected questions involve Again-Again method to determine engagement and 5 -points likert scale with five dimensions to detect what elements exactly motivate participants. The questionnaire instead of containing questions about exact game mechanic asks about experience of each gamified feature. The method of Again-Again table measures user engagement to repeat the whole activity, or part of it again. Opportunity to repeat certain process part will show what exact gamified element is matchable to the service.

The prototypes were developed for mobile devices for availability provide test sessions outside. The prototypes included same address of first point, where user picked up package, and the same address for the final destination to finish delivery. Similar addresses in two prototypes avoid impact of different environment on user perception of package transportation and helps to focus on the experience. In addition to it, all participants of the research drove the same bicycle that was regulated for personal preferences. During experiment the mobile phone with prototypes was

attached to the bicycle. The screen of device was always on during the whole process, so participant could examine it at any time. Before the providing experiment, all participants signed consent form to conducting test session and using their responses for master thesis. They were also instructed with tasks.

5.2 Test participants background information

The delivery service is orientated on bicycle drivers. They have various background as occupation and goals to cycle. The target user group of the delivery service is cycling part of the community using bicycles to save the money, reach close destination, improve health state or other reasons. The requirement for the participants was cycling in their daily life at least once a month.

Participants were 12 females (52,2 %) and 11 males (47,8 %), 15 members in the age between 26 and 30 years old, and others between 18 and 25. According to the collected information, 39,1% of participants (n=9) cycle 2-3 times a week, 47,8% of participants (n=11) cycle once a week and 3 people drives bicycle every day. The test sessions was conducted with each participant separately.

5.3 Analysis of emotional state of participants during using prototype

The survey questionnaires have qualitative aspect as the levels of gradation between answers in five-likert-scale are different. They do not have precise distance of point intervals. However, the test participants may independently refer their emotional state to each item. For this reason the analysis of collected data is based on non-parametric statistical test with independent sample.

The questionnaire consists of five main questions (“How much fun was to use it?”, “How much fun is it to choose the delivery”, “How much fun is it to complete delivery”, “How would you rate your overall experience of delivering”, “Would you deliver the package again”) directed on estimation emotional experience and engagement to the process of using each prototype.

The first group of information is responses on question “How much fun was to use it?”. The likert scale has five points of answers (1=not fun at all, 5=fun at all). This type of question estimates fun experience of the delivery service. The collected data refers to ordinal type. The participants of the experiment test both prototypes. Thus, the chosen test complying with research case is Wilcoxon Signed-Rank test, where condition is gamification [MacKenzie, 2013]. These statistical test determines availability of difference between non-gamified and gamified prototypes. The Wilcoxon Signed-Rank test examines two hypothesis: 1) null hypothesis (H_0) has no difference

between prototypes, distribution is equal to zero; 2) alternative hypothesis (H_1) has difference between prototypes, distribution is not equal to zero. The significance level is equal to 0.05.

The results of analyzed data showed that Z-value (standard deviation) is -3.3413, the p-value is 0.00084 displayed in figure 5.1. The p-level is much lower than determined significance level ($p=0.05$) that leads to rejection of null hypothesis and confirmation of alternative one. There is a strong evidence that gamified prototype provide more fun than non-gamified prototype.

Participant	Non-gamified prototype	Gamified prototype
1	3	4
2	2	4
3	4	5
4	2	4
5	2	4
6	2	3
7	3	4
8	3	3
9	4	4
10	2	5
11	2	5
12	4	5
13	4	5
14	3	4
15	3	3
16	3	5
17	3	4
18	3	4
19	4	2
20	3	4
21	3	4
22	2	4
23	4	5

Result details

W-value: 15.5

Mean Difference: -1.2

Sum of pos. ranks: 15.5

Sum of neg. ranks: 194.5

Z-value: -3.3413

Mean (W): 105

Standard Deviation (W): 26.79

Figure 5.1 the results of Wilcoxon Signed-Rank test to the question “How much fun was to use prototype?”

The gamified prototype has various game mechanics involved at each steps of the delivery service. To determine what mechanism is the most efficient, the survey includes questions about their effect on user perception and examines it in the details. The delivery process is conditionally divided into two complete stages of choosing parcel and transporting it. User can also see it on the pages if prototypes. Therefore, the emotional state of individual processes are also researched.

Next group of data collected from survey question is about assessment of fun level at each stage. The conditions of experiment are congruent to the previous analysis on estimation of fun for the whole delivery. Hence, the research of the case is based on non-parametric test, the data is analyzed

with statistical Wilcoxon Signed-Rank test. The significance level is equal to 0.05. The studied hypothesis of how fun to choose delivery are 1) null hypothesis (H_0) has no difference between prototypes on fun-level at choosing delivery, distribution is equal to zero; 2) alternative hypothesis (H_1) has difference between prototypes on fun-level at choosing delivery, distribution is not equal to zero.

The calculation of the test has following outcome: Z-value is -3.0986, p-value is 0.00194 in figure 5.2. The result is significant at $p \leq 0,05$. The p-value is lower than significance level ($0.00194 < 0,05$) that reject null hypothesis and supports first hypothesis that distributions are different. There is difference between prototypes on choosing delivery.

Participant	Non-gamified prototype	Gamified prototype
1	2	4
2	3	5
3	4	5
4	2	4
5	2	4
6	2	4
7	4	4
8	2	2
9	2	4
10	3	5
11	2	4
12	3	4
13	3	5
14	4	3
15	3	4
16	2	4
17	2	4
18	4	3
19	3	2
20	4	3
21	3	4
22	3	3
23	4	4

Result Details

W-value: 18
Mean Difference: 1
Sum of pos. ranks: 172
Sum of neg. ranks: 18

Z-value: -3.0986
Mean (W): 95
Standard Deviation (W): 24.85

Figure 5.2 the results of Wilcoxon Signed-Rank test to the question “How much fun was to choose delivery?”

The third group of data examines emotional degree of fun after transporting parcel. The conditions of the test case are similar to previous groups, so the non-parametric statistical test is Wilcoxon Signed-Rank test. The studied hypothesis are 1) null hypothesis (H_0) has no difference between prototypes on fun-level at delivery accomplishment, distribution is equal to zero; 2) alternative

hypothesis (H_1) has difference between prototypes on fun-level at delivery accomplishment, distribution is not equal to zero.

The result of Wilcoxon Signed-Rank test is the Z-value equal to -3.2999, the p-value equal to 0.00096 in figure 5.3. The result is significant at $p \leq 0.05$, so null hypothesis is not corroborated. The alternative hypothesis that prototypes have difference on fun after finishing delivery is confirmed by $p < \alpha$ ($0.00096 < 0,05$).

Participant	Non-gamified prototype	Gamified prototype	
1	2	4	
2	3	5	
3	3	5	
4	3	5	
5	4	5	
6	3	4	
7	3	2	
8	4	5	
9	4	4	
10	3	5	
11	3	4	
12	4	5	
13	4	5	
14	3	4	
15	4	5	
16	3	5	
17	4	4	
18	4	3	
19	4	4	
20	3	4	
21	3	5	
22	3	3	
23	3	4	

W-value: 13
Mean Difference: -2
Sum of pos. ranks: 13
Sum of neg. ranks: 177

Z-value: -3.2999
Mean (W): 95
Standard Deviation (W): 24.85

Figure 5.3 the results of Wilcoxon Signed-Rank test to the question “How much fun was to complete delivery?”

Besides the degree of enjoyment during delivery by bike, the next question of the survey is determining the feeling of satisfaction. This question is also based on Five-point likert scale, starting from 1 equal to “highly unsatisfactory”, and to 5 equal to “highly satisfactory”. Despite the five-point scale of answers, the responses do not have accurate equal distances between intervals of numerical values. For this reason, the questionnaire is analyzed with non-parametric test, where answers are ordinal data. The proper test is Wilcoxon Signed-Rank test as in previous survey questions. Such parameter as significance level is 0,05. The null hypothesis justifies no difference

between prototypes on satisfactory level, where distribution is equal to zero. Alternative hypothesis is about difference between prototypes on satisfactory level, where distribution is not equal to zero.

The calculated result of the Z-value is -3.2596. The result of p-value is equal to 0.00056 shown in figure 5.4. The p-value is less than significance level ($0.00056 < 0,05$) that rejects null hypothesis and supports alternative hypothesis. In other words, there is difference between two prototypes regarding user satisfaction on its usage.

Participant	Non-gamified prototype	Gamified prototype	<u>Result Details</u> <i>W-value: 14</i> <i>Mean Difference: -0.58</i> <i>Sum of pos. ranks: 14</i> <i>Sum of neg. ranks: 176</i> <i>Z-value: -3.2596</i> <i>Mean (W): 95</i> <i>Standard Deviation (W): 24.85</i>
1	3	5	
2	3	4	
3	4	5	
4	3	5	
5	4	3	
6	3	5	
7	3	4	
8	4	4	
9	4	4	
10	4	5	
11	3	4	
12	4	5	
13	3	5	
14	3	4	
15	4	5	
16	4	5	
17	4	5	
18	4	4	
19	4	3	
20	4	4	
21	3	5	
22	3	4	
23	3	5	

Figure 5.4 the results of Wilcoxon Signed - Rank test to the question “How would you rate your overall experience of delivering?”

The last question of the survey part considers long term user engagement in the delivery service. It asks user to estimate their further voluntary participation. The type of the question is different in comparison with others, as it is based on Again-Again method. Despite the question type, responses are also analyzed with non-parametric statistical test Wilcoxon Signed - Ranking test. The Significance level is equal to 0,05. Null hypothesis of the test is about no difference in prototypes affecting next participation. Alternative hypothesis supports the difference between prototypes on wish for the next participation.

As shown in the figure 5.5, the Z-value of analyzed data is equal to -2.7693. The p-value is 0.0056. The result is significant at $p \leq 0.05$. The result excludes null hypothesis, but accepts the hypothesis about the difference of prototypes on the interest in joining again.

Participant	Non-gamified prototype	Gamified prototype
1	1	2
2	2	2
3	2	1
4	1	2
5	1	2
6	0	2
7	0	0
8	1	2
9	2	1
10	0	2
11	0	2
12	1	2
13	1	1
14	2	1
15	1	1
16	1	2
17	2	2
18	1	1
19	1	2
20	1	2
21	0	2
22	0	2
23	0	2

W-value: 18
Mean Difference: -1.47
Sum of pos. ranks: 18
Sum of neg. ranks: 135

Z-value: -2.7693
Mean (W): 76.5
Standard Deviation (W): 21.12

Figure 5.5 the results of Wilcoxon Signed - Rank test to the question “Would you deliver the package again?”

5.4 Analysis of gamified features

The last part of the survey is focused on define of success of gamification in general and its separate components. It consists of engagement measurement based on Again-Again method, where user agrees or disagrees with following participation. The analysis of responses compares the experience of using whole prototype with the trial of particular game components represented as the result of the transportation after completion. This comparison researches the difference between perception of gamified service in general and gamified features separately. This part of the thesis determines if individual gameful features are essential for user return to the process. Questions used to measure possible effect are listed in the figure 5.6.

Would you deliver the package again?	1) Would you deliver again because of your personal rating in the service?
	2) Would you deliver again because of your personal health score in the service?
	3) Would you deliver again because of your personal power score in the service?
	4) Would you deliver again to improve all your personal results in the service?
	5) Would you deliver again to help citizens by choosing missions?

Figure 5.6 comparison of engagement of whole experience and gamification components

The investigation of data is based on non - parametric Wilcoxon Signed Ranking test. This method is chosen because of unequal intervals in the response scale. The significance level of the test is equal to 0.05. The hypothesis of the questions is similar in all five groups of responses - no difference between gameful experience of whole service and its features. The studied game elements are rating, health, power scores and choosing missions.

According to the results of the responses shown in figure 5.7, information about obtained personal health and power in the final web page after completing goods transportation affects further participation more than other features. The calculation shows that p-level of analysis of the whole gamified service and health score is equal to 0,01659 that lower significance level (0.05), Z-value is equal to -2.254. The p-level of personal power is equal to 0.04947, the Z-level is -1.6474. Therefore, the calculated parameter does not exceed significance level and rejects null hypothesis.

Participant	Would you deliver the package again?	Would you deliver again because of your personal rating in the service?	Would you deliver again because of your personal health score in the service?	Would you deliver again because of your personal power score in the service?	Would you deliver again to improve all your personal results in the service?	Would you deliver again to help citizens by choosing missions ?
		Z= -0.2197 p=0.41294	Z= -2.1299 p=0.01659	Z= -1.6474 p=0.04947	Z= -0.2353 p=0.40517	Z= -0.9085 p=0.18141
1	2	1	1	1	1	1
2	2	1	2	1	2	1
3	1	2	2	2	2	2
4	2	2	2	2	2	2
5	2	2	2	2	2	2
6	2	1	1	1	1	1
7	0	2	1	1	2	2
8	2	2	0	2	1	1
9	1	0	0	1	1	1
10	2	1	1	2	2	1
11	2	2	2	2	1	2
12	2	2	1	2	2	2
13	1	2	0	2	1	1
14	1	2	2	0	2	2
15	1	2	0	1	2	2
16	2	2	2	2	2	1
17	2	1	1	2	1	2
18	1	2	1	0	2	1
19	2	2	1	0	1	1
20	2	2	1	1	2	2
21	2	1	1	2	1	2
22	2	1	2	1	2	1
23	2	2	2	1	2	1

Figure 5.7 the results of Wilcoxon Signed - Rank test comparing whole experience and gamification components

Such game features as personal health score and power score are more motivational reasons for repeated involvement in comparison with other elements. The reason of increased interest to the information about health can be connected with own values. However, they are not studied in this research. Concerning personal power score as motivating factor for further engagement, the reasons can be also studied in further researches.

Other elements do not distinguished as individual reasons for next delivery and have similar effect as gamification in general. The calculations show that p-level of personal rating is equal to 0,41294, p-level of personal results is equal to 0,40517 and p-level of choosing missions is 0,18141. Their p-levels are higher than significance level (that is equal to 0,05) that supports null hypothesis about no difference between chosen conditions.

The output of analysis of gamified features showed that most of the studied gamification elements are perceived as a general service. Hence, the designed prototype integrated game mechanisms totally and they are logically connected with each other. According to Yu-kai Chou [Chou, 2016], such gamification leads to the more significant result.

6. Discussions

6.1 Findings

In total, there were 23 participants involved in the test sessions of two prototypes. According to analyzed responses the gamification model based on Octalysis framework changes user perception in the delivery service. The difference in the results of statistical test supports the increase of such emotions as fun, enjoyment and satisfaction.

Five questions were focused to measure psychological state in accordance with the likert scale. All indexes calculated with the Wilcoxon Ranking test do not exceed significance level. The numerical values are less than 0,05. The results are shown in figure 6.1

Question	Number of participants	Significance
How much fun was to use it?	23	$p < 0.05$
How much fun is it to choose the delivery?	23	$p < 0.05$
How much fun is it to complete delivery?	23	$p < 0.05$
How would you rate your overall experience of delivering?	23	$p < 0.05$
Would you deliver the package again?	23	$p < 0.05$

Table 6.1 the results of analyzed data.

The analysis of conducted test displayed that there gamified differs with non-gamified prototype in fun in general and at different stages of delivery. In addition, the complementary rate of emotional state as satisfaction was also tested. The non-gamified prototype concedes in arousing positive emotional feelings.

The possibility that participant will come back to the gamified service is higher than return to the non-gamified system. Moreover, user is captivated by the whole gamification process. Only effectiveness of health and power scores are statistically counted. Other features in the gamified prototypes are not distinguished to the user and perceived as a whole service.

The design consists factors impacting both intrinsic and extrinsic motivations. Combination of two models complements and strengthen each other. Although, the design predominances intrinsic motivation as it is significant condition for entertainment and engagement.

6.2 Limitations and potential improvements

The limitations of this thesis is defined by the environment and test participants. According to the their backgrounds, most of them are not cycling on regular basis. The novelty of the action could affect their perception of the delivery service. From one side, they could enjoy cycling as physical diversity, from another side it could be irritating to drive to established route.

The landscape of the chosen route is multifarious, and the city obtains separate road for bicycle vehicle. It passes part of the park and the building, the roads are safe and convenient. For this reason, the city diversity is additional tool for member enjoyment. In contrast, the identical view of surroundings may bore cyclist. Moreover, the absent cycling routes are dangerous and able to decrease the growth of the service development.

The research of game balance in the designed gamified prototype is not studied in this thesis. This question is able to be continued in next research to understand how total concept is complicated and challengeable.

The gamified prototype contains appropriate elements for different playing behavior. The precise research of correlation between playing type and gamified feature in the service is able to increase the gamification influence.

The gamification area and development of mobile devices give many perspectives of further evolution. The designed changes of the service are mainly implemented in the interface design. For future work, the prototype is able to involve other features. The input and output may contain voice commands and audio feedback. In addition to it, including augmented reality in the service may expand the real world and make it more immersive. For example the supportive message during

cycling could be changed from written to audio. It also does not disturb cyclist from driving. Mentioned modifications can strengthen the immersive nature of the product and entertain person.

7. Conclusions

This thesis examines the low engagement in crowdsourcing and methods to increase number of people in community. The research is based on a web-service with ride-sharing as goods. The participants of the transportation are cyclists. The research covers the review of reasons affecting engagement, the productive method to integrate gamification and comparison of two prototypes.

The first question of the research studies reasons of the engagement. One of the way to retain current members and enhance new one is alteration of emotional behaviour. The Such feelings as fun, enjoyment and satisfaction are the base of intrinsic motivation that may increase individual behaviour to participate in the activity. The chosen solution to affect emotional state is gamification. This method applies fundamental game principles and impacts emotions at different degree. The use of game mechanics connects with entertaining nature and capacity to keep players for sustain time.

The implemented design of the prototype includes certain game mechanics that based on the Octalysis framework to trigger intrinsic motivation and partly extrinsic motivation. The proper game elements for achieving necessary emotional are accurately selected according to the first three levels of the framework. Each game feature is focused on generation positive emotional state. The perception of gamified prototypes concerns core drivers of the framework and playing behavioral model.

The goal of the developed design is turn part-time members from single-participation to the repetitive action. The designed prototype concerns physical process of cycling and includes actionable scenario. It has Superhero concept with missions, where mission is delivery. The prototype does not have only specific awards for mission accomplishment, but the whole user interface supports developed storyline. The new service consists of accurately organized information to entertain user during the process. The components used in the design of gamified delivery service refers to the second research question.

The effectiveness of gamification method is tested with 23 participants by comparison gamified and non-gamified prototypes. The statistical analysis of responses confirms the distinction of emotional state between two prototypes. Therefore, gamification based on Octalysis framework and developed for certain user group affects fun, enjoyment and satisfaction of transporting parcels. For this

reason, applied design increases number of new participants in crowdsourcing service. In addition, player perceives the aggregate of all game components. not only parts of them.

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